Tensor-based compressed estimation of frequency-selective mmWave MIMO channels

Prof. André L. F. de Almeida, Wireless Telecom Research Group (GTEL),Federal University of Ceará (UFC), Fortaleza, Brazil

In this talk, we address the channel estimation problem for mmWave MIMO channels using a hybrid analog-digital architecture. By modeling the effective frequency-selective MIMO channel as a 3-order tensor, we link the channel estimation problem to the theory of multi-way compressive sensing of sparse tensors via Parallel Factor (PARAFAC) analysis. By leveraging on this link, a joint estimation of the compressed channel bases (spatial transmit, spatial receive and delay) can be obtained by means of an alternating least squares algorithm. Once these bases are estimated, the channel parameters are extracted by solving simpler compressive sensing (CS) problems per dimension of the channel tensor. Some useful bounds on the minimum number of beams and pilot sequence length can be derived from Kruskal's uniqueness conditions for sparse PARAFAC models.